

The invention is claimed as follows:

1. A spacer used for separating and supporting products which are stored and/or transported in a stacked configuration or array, said spacer comprising:

5 a plurality of sheets of material which have been laminated on top of one another and secured to one another with an adhering means, said plurality of sheets defining a plurality of alternating curved peak portions and valley portions such that said plurality of sheets are formed in a wave-like configuration, said plurality of sheets further defining first and second outer surfaces and first and second edges which are provided between said first and second  
10 outer surfaces, the products being supported by one of said first and second edges of said plurality of sheets.

2. A spacer as defined in claim 1, wherein said adhering means is an adhesive.

15 3. A spacer as defined in claim 1, wherein said material is paperboard.

4. A spacer as defined in claim 3, wherein said paperboard has grain fibers provided therein, said grain fibers of said paperboard generally running perpendicularly to said first and second edges, such that said grain fibers generally extend from said first edge to said second  
20 edge.

5. A spacer as defined in claim 1, wherein said curved peak portions are provided by first curved portions and wherein said curved valley portions are provided by second curved portions, said first curved portions being connected to said second curved portions.

6. A spacer as defined in claim 5, wherein said first curved portions are connected to said second curved portions by leg portions.

7. A spacer as defined in claim 6, wherein said leg portions are generally elongated.

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8. A spacer as defined in claim 1, wherein eight sheets of material have been laminated on top of one another and secured to one another with an adhering means.

9. A spacer as defined in claim 1, wherein said spacer has a length of approximately  
10 forty-eight inches, a width of approximately two and a half inches, a height of approximately four inches, and a thickness of approximately one-quarter of an inch.

10. A spacer as defined in claim 1, wherein said spacer is configured to support between approximately fifteen thousand and twenty thousand pounds.

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11. A spacer as defined in claim 1, wherein said spacer is configured to be nestable with another spacer.

12. A spacer as defined in claim 1, wherein said spacer is configured to weigh between  
20 approximately one and two pounds.

13. A spacer used for separating and supporting products which are stored and/or transported in a stacked configuration or array, said spacer comprising:

a first spacer segment which defines a plurality of alternating curved peak portions and curved valley portions such that said first spacer segment is formed in a wave-like configuration, said first spacer segment further defining first and second edges; and

a second spacer segment which defines a plurality of alternating curved peak portions and curved valley portions such that said second spacer segment is formed in a wave-like configuration, said second spacer segment further defining first and second edges;

wherein said second spacer segment is positioned next to said first spacer segment such that said first edges of said first and second spacer segments are generally planar and such that said second edges of said first and second spacer segments are generally planar, said curved peak portions of said first and second spacer segments being secured to one another by an adhering means, the products being supported by one of said first and second edges of said first and second spacer segments.

14. A spacer as defined in claim 13, wherein each said spacer segment is formed of a plurality of sheets of material which have been laminated on top of one another and secured to one another, said plurality of sheets further defining first and second outer surfaces of each said spacer segment.

15. A spacer as defined in claim 14, wherein said material is paperboard.

16. A spacer as defined in claim 15, wherein said paperboard has grain fibers provided therein, said grain fibers of said paperboard generally running perpendicularly to said first and second edges of said first and second spacer segments, such that said grain fibers generally extend from said first edges of said first and second spacer segments to said second edges of said first and second spacer segments.

17. A spacer as defined in claim 15, wherein eight sheets of material have been laminated on top of one another and secure to one another.

18. A spacer as defined in claim 14, wherein said spacer has a length of approximately forty-eight inches, a width of approximately two and a half inches, a height of approximately four inches, and a thickness of approximately one-quarter of an inch.

19. A spacer as defined in claim 13, wherein said adhering means is an adhesive.

20. A spacer as defined in claim 13, wherein said curved peak portions are provided by first curved portions and wherein said curved valley portions are provided by second curved portions, said first curved portions being connected to said second curved portions.

21. A spacer as defined in claim 20, wherein said first curved portions are connected to said second curved portions by leg portions.

22. A spacer as defined in claim 21, wherein said leg portions are generally elongated.

23. A spacer as defined in claim 13, wherein said spacer is configured to support between approximately fifteen thousand and twenty thousand pounds.

24. A spacer as defined in claim 13, wherein said spacer is configured to weigh between  
5 approximately one and two pounds.

25. A method of stacking sheets of material for storing and/or transporting said sheets of material, said method comprising the steps of:

a) providing a plurality of said sheets of material;

10 b) providing a plurality of spacers which have a wave-like configuration and which have first and second edges;

c) placing at least one of said spacers on top of a stacking surface such that said first edge of said at least one spacer is positioned against said stacking surface;

15 d) stacking at least one of said plurality of sheets of material on top of one another to form a lift of sheets of material; and

e) supporting said lift of sheets of material by placing said lift on top of said at least one spacer such that said second edge of said at least one spacer is positioned against said lift of sheets of material, and such that said at least one spacer separates said lift from said stacking surface.

26. A method as defined in claim 25, wherein each said spacer comprises a plurality of sheets of paperboard which have been laminated on top of one another and secured to one another with an adhering means, said plurality of sheets defining a plurality of alternating curved peak portions and valley portions such that said plurality of sheets are formed in said wave-like configuration.

27. A method as defined in claim 25, wherein each said spacer comprises a first spacer segments which defines a plurality of alternating curved peak portions and curved valley portions such that said first spacer segments is formed in said wave-like configuration, and a second spacer segment which defines a plurality of alternating curved peak portions and curved valley portions such that said second spacer segment is formed in said wave-like configuration, said second spacer segment being positioned next to said first spacer segment such that said curved peak portions of said first and second spacer segments are secured to one another by an adhering means.

28. A method as defined in claim 25, wherein each said spacer is configured to weigh between approximately one and two pounds.

29. A method as defined in claim 25, wherein each said spacer is configured to support between approximately fifteen thousand and twenty thousand pounds.

30. A method of forming spacers which are used for separating and supporting products which are stored and/or transported in a stacked configuration or array, said method comprising the steps of:

- a) providing a plurality of sheets of paperboard;
- 5 b) forming a stack of sheets, from said plurality of sheets, which are bonded together;
- c) forming a wave-like product from said bonded stack of sheets;
- d) allowing said wave-like product to cure for a predetermined time period; and
- e) cutting said cured wave-like product to provide said spacers.

10 31. A method as defined in claim 30, wherein said step (b) comprises the sub-steps of:

- b1) applying a bonding means to a top surface of one of said plurality of sheets;
- b2) positioning another one of said plurality of sheets on top of said one sheet which has said bonding means on said top surface thereof; and

15 b3) repeating sub-steps (b1) and (b2) until said formed stack of sheets has the number of sheets desired.

32. A method as defined in claim 30, further comprising the steps of:

- f) providing a linerboard roll with continuous paperboard wrapped therearound;
- 20 and
- g) cutting said continuous paperboard into said plurality of sheets of paperboard.

33. A method of forming spacers which are used for separating and supporting products which are stored and/or transported in a stacked configuration or array, said method comprising the steps of:

- a) providing a plurality of sheets of paperboard;
- b) forming a wave-like product from said plurality of sheets of paperboard;
- c) allowing said wave-like product to cure for a predetermine time period; and
- d) cutting said cured wave-like product into said plurality of spacers.

34. A method as defined in claim 33, wherein step (b) comprises the sub-steps of:

- b1) providing a first sheet of paperboard;
- b2) placing said first sheet of paperboard onto a first conveyor;
- b3) providing a second sheet of paperboard;
- b4) applying a bonding means to a lower surface of said second sheet of paperboard;
- b5) bonding said second sheet of paperboard to said first sheet of paperboard;
- b6) forming a first wave-like product from said bonded first and second sheets of paperboard; and
- b7) repeating sub-steps (b3)-(b6) until said wave-like product of step (b) is formed.



35. A method as defined in claim 34, wherein sub-step (b6) comprises the sub-steps of:

b6') submitting said bonded first and second sheets of paperboard into a first forming conveyor which has an upper die conveyor and a lower die conveyor, said bonded first and second sheets of paperboard being submitted between said upper and lower die conveyors; and

b6'') moving said bonded first and second sheets of paperboard through said first forming conveyor toward a second forming conveyor to mold said bonded first and second sheets of paperboard into said first wave-like product.

36. A method of forming spacers which are used for separating and supporting products which are stored and/or transported in a stacked configuration or array, said method comprising the steps of:

a) providing an apparatus which includes a plurality of linerboard rolls having continuous paperboard wrapped therearound, a festooning system, a die station having a plurality of dies, and a cutter;

b) pulling said continuous paperboard from each of said linerboard rolls toward said festooning system such that said paperboard from each of said linerboard is layered, one on top of the other;

c) connecting said layers of continuous paperboard together to form a laminated product;

d) submitting said laminated product to said plurality of dies to form a wave-like product;

e) allowing said wave-like product to cure for a predetermined time period; and

f) cutting said wave-like product into said spacers.

37. A method of forming spacers which are used for separating and supporting products which are stored and/or transported in a stacked configuration or array, said method comprising the steps of:

a) providing a plurality of sheets of paperboard;

5 b) forming a stack of sheets, from said plurality of sheets, which are bonded together;

c) forming a wave-like product from said bonded stack of sheets;

d) allowing said wave-like product to cure for a predetermined time period;

e) cutting said cured wave-like product to provide extra wide spacer products;

10 f) splitting said extra wide spacer products apart such that a pair of spacer segments are provided from each said extra wide spacer product;

g) positioning said spacer segments next to one another such that curved portions of one of said spacer segments are positioned proximate to curved portions of said other one of said spacer segments; and

15 h) securing said two spacer segments together along said curved portions of said two spacer segments from a first edge of said two spacer segments to a second edge of said two spacer segments in order to form said spacer.

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38. A method of forming spacers which are used for separating and supporting products which are stored and/or transported in a stacked configuration or array, said method comprising the steps of:

- a) providing a plurality of sheets of paperboard;
- b) forming a wave-like product from said plurality of sheets of paperboard;
- c) allowing said wave-like product to cure for a predetermine time period; and
- d) cutting said cured wave-like product to provide extra wide spacer products;
- e) splitting said extra wide spacer products apart such that a pair of spacer

segments are provided from each said extra wide spacer product;

f) positioning said spacer segments next to one another such that curved portions of one of said spacer segments are positioned proximate to curved portions of said other one of said spacer segments; and

g) securing said two spacer segments together along said curved portions of said two spacer segments from a first edge of said two spacer segments to a second edge of said two spacer segments in order to form said spacer.

39. A method of forming spacers which are used for separating and supporting products which are stored and/or transported in a stacked configuration or array, said method comprising the steps of:

a) providing an apparatus which includes a plurality of linerboard rolls having continuous paperboard wrapped therearound, a festooning system, a die station having a plurality of dies, and a cutter;

b) pulling said continuous paperboard from each of said linerboard rolls toward said festooning system such that said paperboard from each of said linerboard is layered, one on top of the other;

c) connecting said layers of continuous paperboard together to form a laminated product;

d) submitting said laminated product to said plurality of dies to form a wave-like product;

e) allowing said wave-like product to cure for a predetermined time period; and

f) cutting said cured wave-like product to provide extra wide spacer products;

g) splitting said extra wide spacer products apart such that a pair of spacer segments are provided from each said extra wide spacer product;

h) positioning said spacer segments next to one another such that curved portions of one of said spacer segments are positioned proximate to curved portions of said other one of said spacer segments; and

i) securing said two spacer segments together along said curved portions of said two spacer segments from a first edge of said two spacer segments to a second edge of said two spacer segments in order to form said spacer.

40. An assembly for forming a wave-like product having a plurality of peak and valley portions from a bonded stack of sheets of paperboard, the formed wave-like product being used to form spacers capable which are used for separating and supporting products which are stored and/or transported in a stacked configuration or array, said assembly comprising:

5 a first end for receiving the bonded stack of sheets;

a second end for emitting said wave-like product;

means for pushing downwardly onto the bonded stack of sheets to form the valley portions of said wave-like product, said downwardly pushing means generally provided between said first and second ends; and

10 means for pushing upwardly onto the bonded stack of sheets to form the peak portions of said wave-like product, said upwardly pushing means generally provided between said first and second ends.

41. An assembly as defined in claim 40, wherein said downwardly pushing means is  
15 positioned above said upwardly pushing means.

42. An assembly as defined in claim 40, wherein said downwardly pushing means is offset from said upwardly pushing means.

43. An assembly as defined in claim 40, wherein said downwardly pushing means includes a plurality of continuous cables, said plurality of continuous cables extending between said first end and said second end and being configured to rotate in a first direction, and wherein said upwardly pushing means includes a plurality of continuous cables, said plurality of cables of said upwardly pushing means extending between said first end and said second end and being configured to rotate in a second, opposite direction, said rotating pluralities of continuous cables configured to move the bonded stack of sheets from said first end to said second end as the bonded stack of sheets is formed into said wave-like product.

44. An assembly as defined in claim 43, wherein said downwardly pushing means further includes a first rotating shaft at said first end, a second rotating shaft at said second end, and a plurality of discs secured to said first and second rotating shafts of said downwardly pushing means, said plurality of continuous cables of said downwardly pushing means configured to be wrapped around said plurality of discs of said downwardly pushing means and thus rotated by the rotation of said first and second rotating shafts of said downwardly pushing means, and wherein said upwardly pushing means further includes a first rotating shaft at said first end, a second rotating shaft at said second end, and a plurality of discs secured to said first and second rotating shafts of said upwardly pushing means, said plurality of continuous cables of said upwardly pushing means configured to be wrapped around said plurality of discs of said upwardly pushing means and thus rotated by the rotation of said first and second shafts of said upwardly pushing means.

45. An assembly as defined in claim 44, wherein said first rotating shaft of said downwardly pushing means is positioned above said first rotating shaft of said upwardly pushing means, and wherein said second rotating shaft of said downwardly pushing means is positioned above said second rotating shaft of said upwardly pushing means.

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46. An assembly as defined in claim 45, wherein a distance between said first rotating shafts is greater than a distance between said second rotating shafts.

47. An assembly as defined in claim 44, wherein said plurality of discs on said first rotating shaft of said downwardly pushing means are offset from said plurality of discs on said first rotating shaft of said upwardly pushing means, and wherein said plurality of discs on said second rotating shaft of said downwardly pushing means are offset from said plurality of discs on said second rotating shaft of said upwardly pushing means.

48. An assembly as defined in claim 47, wherein a distance between said plurality of discs on said first rotating shafts is greater than a distance between said plurality of discs on said second rotating shafts.

49. An assembly as defined in claim 47, wherein a diameter of said plurality of discs on said second rotating shafts is greater than a diameter of said plurality of discs on said first rotating shafts.

50. An assembly for forming a multi-layered wave-like product from sheets of paperboard, the multi-layered wave-like product being used to form spacers which are used for separating and supporting products which are stored and/or transported in a stacked configuration or array, said assembly comprising:

5 first and second means for storing said sheets of paperboard;

means for applying an adhesive to said sheets of paperboard stored by said second storing means;

means for preparing a laminated multi-layered sheet from a sheet of paperboard from said first storing means and a sheet of paperboard from said second storing means which has  
10 had adhesive applied thereto by said applying means;

means for forming said laminated multi-layered sheet into a multi-layered wave-like product.

51. An assembly as defined in claim 50, further comprising means for storing, applying,  
15 preparing and forming additional sheets of paperboard to said multi-layered wave-like product.

52. An assembly as defined in claim 51, wherein said assembly forms a multi-layered wave-like product which has at least three sheets of paperboard.

20 53. An assembly as defined in claim 52, wherein said assembly forms a multi-layered wave-like product which has eight sheets of paperboard.



54. An assembly as defined in claim 50, wherein said first and second storing means are  
hoppers.

55. An assembly as defined in claim 50, wherein said forming means includes a forming  
5 conveyor having an upper die conveyor and a lower die conveyor.

56. An assembly as defined in claim 55, wherein said upper die conveyor is a rotatable  
elongated conveyor which has an outer surface with a continuous die provided therearound,  
and wherein said lower die conveyor is a rotatable elongated conveyor which has an outer  
10 surface with a continuous die provided therearound, said laminated multi-layer sheet being  
moved between said upper and lower die conveyors and being formed into said multi-layered  
wave-like product by said upper and lower die conveyors.

57. An assembly as defined in claim 56, wherein each of said continuous dies of said  
15 upper and lower die conveyors includes alternating curved peak portions and curved valley  
portions, said curved peak portions of said upper die conveyor configured to be positioned  
above said curved valley portions of said lower die conveyor and said curved valley portions  
of said upper die conveyor configured to be positioned above said curved peak portions of  
said lower die conveyor such that as said laminated multi-layered sheet passes between said  
20 curved peak portions and said curved valley portions of said upper and lower die conveyors,  
said laminated multi-layered sheet is formed into said multi-layered wave-like product.

58. An assembly for forming a wave-like product having a plurality of peak and valley portions, the formed wave-like product being used to form spacers capable which are used for separating and supporting products which are stored and/or transported in a stacked configuration or array, said assembly comprising:

5 a plurality of linerboard rolls having continuous paperboard wrapped therearound;  
a festooning system for festooning said continuous paperboard from said plurality of linerboard rolls;

means for pulling said continuous paperboard from each of said linerboard rolls toward said festooning system;

10 means for laminating together said continuous paperboard from each of said linerboard rolls; and

a plurality of dies for forming said laminated continuous paperboard into said wave-like product.

15 59. An assembly as defined in claim 58, wherein eight linerboard rolls are provided.